

## P E T I T I O N

1 Commissioner for Patents  
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5 Your Petitioner, THOMAS P. GODFREY, a citizen of the United States and a  
resident of the State of Nebraska, whose post office address is 12488 Woodcrest Drive,  
Omaha, NE 68137, prays that Letters Patent may be granted to him for an

### ANIMATED FIGURE

set forth in the following specification.

### BACKGROUND OF THE INVENTION

10 The present invention relates to animated figures and more particularly to an  
animated figure that incorporates the use of a plurality of cams and control rods to  
impart fluid and natural movements to the appendages of the animated figure.

### DESCRIPTION OF THE PRIOR ART

15 Animated figures are frequently used for indoor and outdoor displays relating to  
various holidays, products, or simply for decoration. Typically, the animated figure is  
provided with a body portion and at least one appendage, such as an arm, a head, or a  
set of legs that moves with respect to the body portion. A motor is disposed within the  
20 body portion and coupled to the appendage through a mechanical connection that  
permits the appendage to move. However, regardless of their level of complexity, prior  
art animated figures have failed to provide fluid and lifelike appendage movement.  
Rather, the motion of the appendages on prior art animated figures appears mechanical  
and fails to follow a natural range of motion.

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1 U.S. Patent No. 4,177,602 discloses an automated figure that is provided with  
movable leg members. The leg members are jointed at the knee and coupled to a body  
portion at the "hip." A motor within the body portion rotates a cam member that is  
connected to the leg, beneath the knee joint, by an elongated connecting rod. While  
5 the rotating cam does move the leg in a generally forward walking motion, it lacks the  
fluid, natural range of motion exhibited by the leg of an animal or a person. No joint is  
provided at the "ankle" of the leg, and the required engagement of the connecting rod  
between a pair of fulcrum pins creates a mechanical and somewhat clumsy motion.

10 U.S. Patent No. 61,416 discloses an automatic toy in the shape of a horse. The  
toy is provided with a simple wind-up motor that is geared to extend and retract a  
plurality of pivotably coupled bars that extend through the length of each leg member.  
Each leg is comprised of an upper leg portion, lower leg portion, and a hoof. Both the  
upper and lower leg portions are provided with a pair of the rods, which are pivotably  
15 linked to one another at their end portions. Each of the joints in the leg members are  
provided with at least three pivot points that enable the joints to bend. Accordingly, as  
the motor operates in a forward direction, the legs are extended and retracted in a  
gimping motion. However, the motion attained by the skeleton of pivotably linked bars  
is machinelike and limited in its range of motion. Moreover, the assembly of such a  
20 jointed skeletal system is fairly complex and is susceptible to frequent mechanical  
failures due to the intricate structure.

25 Accordingly, what is needed is an improved system and method for providing an  
animated figure with fluid and natural appendage movement.

## SUMMARY OF THE INVENTION

1           The animated figure of the present invention is generally provided with at least  
one jointed appendage, which is pivotably coupled to a body portion. A motor is  
provided within the animated figure and selectively rotates a shaft, which is positioned  
5       adjacent the appendage. A first cam is coupled to a follower groove within the  
appendage so that the appendage will pivot with respect to the body when the shaft is  
rotated. In a preferred embodiment, a first control rod is pivotably coupled to the first  
cam at one end and pivotably coupled at its other end to the appendage adjacent the  
10       joint. Accordingly, as the first cam rotates and the appendage pivots, the control rod  
bends the appendage at the joint. In another embodiment, a second joint can be  
provided within the appendage to serve as an "ankle" or "wrist" of the appendage. A  
second control rod may be coupled to the appendage adjacent the first and second  
joints. In this configuration, when the first joint bends, the second joint will bend.

15           The animated figure of the present invention can be provided with pairs of  
appendages and, where a four-legged animal is to be portrayed, forward and rearward  
pairs of appendages can be provided. Each of the appendages can be provided with  
one or more joints and control rods to move in response to the rotation of a cam in the  
20       same manner as the previously described appendage. The motion of each of the  
separate appendages can be mechanically timed with one another to provide the  
appearance of the independently-moving appendages of any two- or four-legged figure.  
Moreover, this same structural design could be provided to create moving "arms" for the  
animated figure.

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In still another embodiment, neck and head portions are provided to the animated figure and are pivotably coupled to one another and the body. An eccentric cam secured to the shaft imparts forward and rearward motion to the neck. A control rod, which is coupled to the neck and head portions, pivots the head as the neck pivots. This provides the appearance of independent head and neck movement while the animated figure is in motion.

Accordingly, one of the principal objects of the present invention is to provide an animated figure having one or more appendages that move in a fluid and natural manner with respect to the body of the figure.

A further object of the present invention is to provide an animated figure having a plurality of appendages that fluidly and naturally move in concert with one another to emulate the natural motion of a two- or four-legged figure.

Still another object of the present invention is to provide an animated figure with neck and head portions that move naturally in concert with one or more appendages of the figure.

Yet another object of the present invention is to provide an animated figure that displays fluid and natural movement characteristic of the particular animal or person that the figure is emulating.

A further object of the present invention is to provide an animated figure that utilizes at least one cam and at least one control rod to provide fluid and natural motion to an appendage of the figure.

1 Still another object of the present invention is to provide an animated figure  
having a simple and durable structural design that exhibits fluid and natural appendage  
movement.

5 These and other objects of the present invention will be clear to those of skill in  
the art.

#### BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a perspective view of one embodiment of the animated figure of the  
present invention;

10 Figure 2 is a side elevation view of the animated figure of Figure 1;

Figure 3 is a side elevation view of the animated figure of Figure 1 demonstrating  
some of the fluid and natural appendage movements that can be obtained with the  
depicted embodiment;

15 Figure 4 is a partial side view of the head and neck portions of one embodiment  
of the present invention demonstrating some of the fluid and natural movements that  
can be obtained with the depicted embodiment; and

20 Figure 5 is a partial side view of an appendage of one embodiment of the  
present invention demonstrating some of the fluid and natural movements that can be  
obtained with the depicted embodiment.

#### DESCRIPTION OF THE PREFERRED EMBODIMENT

25 The animated figure 10 of the present invention is generally depicted in Figures  
1-5. Although the animated figure 10 is depicted as being a four-legged animal, it is  
contemplated that the inventive concepts of the present invention will be equally

1 applicable to the creation of two-legged figures, figures with arms and legs, figures with  
moving neck and head portions, and any desired combination of such body parts. For  
purposes of conciseness, however, the animated figure 10 of the present invention will  
be generally described as being a four-legged animal.

5 The animated figure 10 is generally provided with a body frame 12, which may  
further incorporate one or more body plates 14. At least one appendage 16, such as a  
leg, arm, neck, head or tail, will be pivotably coupled to the body frame 12 and/or body  
plates 14. In the present example, the appendage 16 is a leg having an upper segment  
10 18, which is pivotably coupled to a lower segment 20 at a first joint 22. The upper  
segment 18 is pivotably coupled to the body plate 14 so that it may be selectively  
pivoted in forward and rearward directions with respect to the body plate 14.

An axle 24 is rotatably coupled to the body frame 12 adjacent the upper segment  
18 of the appendage 16. The axle 24 is selectively rotated with respect to the body  
15 frame 12 by a motor 26. The motor 26 may be of any conventional type, including, but  
not limited to, electrical, internal combustion, or a stored tension motor that uses a  
spring that is manually wound with a key. It is further contemplated that the motor 26  
could simply be manually operated through a crank or similar means when desired.  
20 Regardless, the motor 26 is operatively coupled to the shaft 24 through a belt 28 and/or  
a plurality of matable gear members. Accordingly, as the motor 26 is engaged,  
rotational movement is imparted upon the axle 24.

A cam 30 is coupled to the axle 24 so that the cam 30 rotates with the axle 24.  
Although the cam 30 is generally depicted as being round and disc-shaped, it will be

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apparent to those of skill in the art that the cam 30 may be provided in nearly any  
shape, according to the given working parameters. A pin 32 is secured to the cam 30  
so that the pin 32 extends outwardly therefrom. A generally elongated follower groove  
34 is formed in the upper segment 18 of the appendage 16 and is preferably shaped to  
5 at least partially receive a portion of the pin 32 therein. The follower channel 34 is  
provided with opposite ends and a length extending therebetween, along which the pin  
32 may freely travel. Accordingly, as the cam 30 is rotated, the pin 32 will travel along  
the follower groove 34 while the pin 32 and cam 30 travel along their generally orbital  
path. This action imparts a fluid and natural pivoting motion to the upper segment 18  
10 about the pivot point 36. The characteristics of the pivoting motion can be easily  
changed by the modification of the location, length and/or shape of the follower groove  
34.

15 In a preferred embodiment, an upper control rod 38 is pivotably coupled at one  
end to the pin 32 and is pivotably coupled to the lower segment 20 adjacent the joint 22  
at its other end. Accordingly, as the pin 32 and cam 30 rotate, the upper control rod 38  
will bend the appendage 16 at the joint 22. The proximity with which the upper control  
rod 38 is coupled to the lower segment 20 adjacent the joint 22 will determine the  
20 characteristics of the bending motion of the joint 22. Accordingly, a combination of the  
pin 32 and follower groove 34 along with the upper control rod 38 impart a fluid and  
natural movement to the appendage 16 at its pivot point 36 and the joint 22.

25 It may be desirable to include a third or bottom segment 40 to the appendage 16  
to provide a hand, foot or hoof to the appendage 16. Preferably, the bottom segment



1 40 is pivotably coupled to the lower segment 20 at a second joint 42. Controlled  
bending of the second joint 42 can be obtained by providing the appendage 16 with a  
lower control rod 44 which is pivotably coupled to the upper segment 18 adjacent the  
joint 22 at one end and pivotably coupled to the bottom segment 40 adjacent the  
5 second joint 42. Accordingly, lower control rod 44 will work in concert with the upper  
control rod 38 in response to the rotation of the cam 30 and the pin 32 to bend the  
second joint 42 as the appendage 16 moves with respect to the body plate 14.

10 Where desired, an opposing appendage 16' can be provided opposite  
appendage 16. The opposing appendage 16' is preferably constructed in much the  
same manner as that described for appendage 16. Movement of the opposing  
appendage 16' is at least partially provided through a second cam 30', which is coupled  
to the shaft 24 opposite the first cam 30. The position of the cams 30 and 30' as they  
are coupled to the shaft 24 can be selectively adjusted to time the movement of the  
15 appendages 16 and 16' to provide a fluid and natural walking or running movement to  
the animated figure 10.

20 Additional appendages may be also provided, such as the example of the rear  
legs 46 and 46' depicted in Figures 1-3. It is preferred that the structure of the legs 46  
and 46' be similar to one another. Accordingly, for purposes of conciseness, only the  
leg 46 will be described herein. The leg 46 is preferably provided with at least an upper  
segment 48 and a lower segment 50 and may be optionally provided with a third or  
bottom segment 52. The upper segment 48 is pivotably coupled to the body plate 14 at  
the point 54. A rear axle 56 is pivotably coupled with the body frame 12 and is  
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operatively coupled to the motor 26 much in the same fashion as that described for axle 24. A third cam 58 is secured to the rear axle 56 so that it rotates therewith. A pin member 60 extends outwardly from the third cam 58 and is at least partially received by, and slidably movable within, a follower groove 62 formed in the upper section 48 of the leg 46. The movement imparted to the upper segment 48 by the movement of the pin 60 within the follower groove 62 is similar to that described previously for pin 32 and the follower groove 34. An upper control rod 64 is coupled to the pin 60 and pivotably coupled to the leg 46 adjacent a joint 66, which pivotably couples the upper segment 48 with the lower segment 50. Where a bottom segment 52 is provided, it is preferred that a lower control rod 68 be coupled to the upper segment 48 adjacent the joint 66 at one end and pivotably coupled to the bottom segment 52 adjacent a joint 70, which pivotably couples the lower segment 50 with the bottom segment 52. It is preferred that the cams that movably couple the legs 46 and 46' to the rear axle 56 be oriented to time the movement of the legs 46 and 46' to impart a natural walking or running motion to the same. Similarly, it is preferred that the movement of legs 46 and 46' be timed to move in cooperation with the appendages 16 and 16' to further create the appearance of a natural motion among the appendages. It is contemplated that, in the example where a bipedal figure is desired, that the legs 46 and 46' will be timed to move in cooperation with appendages 16 and 16', which might serve as the figure's arms.

The animated figure 10 may optionally be provided with a neck portion 72, which is preferably pivotably coupled with the body frame 12 and/or the body plates 14 at a pivot point 84. A head portion 74 may then be secured atop the neck portion 72. It is

1 preferred that the head portion be pivotably coupled to the neck portion 72 so that the  
two structures may pivot at least slightly with respect to one another. Motion may be  
imparted to the neck portion 72 and the head portion 74 through a neck cam 76, which  
is preferably secured to the axle 24 such that the neck cam 76 rotates therewith. As  
5 the neck cam 76 rotates, it engages the lower end portion 78 of the neck portion 72 so  
that the neck portion 72 pivots rearwardly and forwardly in response to such  
engagement. It is contemplated that the shape of the neck cam 76 could be provided  
to effectuate the desired rate and character of movement imparted upon the neck  
portion 72. A neck control rod 80 is preferably provided and pivotably coupled at one  
10 end to the body plate 14 and/or the body frame 12 and pivotably coupled at the  
opposite end to the head 74. Accordingly, depending on the location that the opposite  
end portions of the neck control rod 80 are coupled to these structures and their  
respective pivot points 82 and 84, the characteristics of the head motion with respect to  
15 the neck 72 and the body plate 14 will vary. Preferably, the shape of the neck cam 76  
as well as the location of the neck control rod 80 will be provided such that the head  
and neck cooperate in a fluid and natural forward and rearward motion with respect to  
the body frame 14 and further cooperate with the appendages 16, 16', 46 and 46' to  
20 facilitate the fluid and natural movement of the animated figure 10 as a whole.

In the drawings and in the specification, there have been set forth preferred  
embodiments of the invention; and although specific items are employed, these are  
used in a generic and descriptive sense only and not for purposes of limitation.  
Changes in the form and proportion of parts, as well as substitution of equivalents, are

1 contemplated as circumstances may suggest or render expedient without departing  
from the spirit or scope of the invention as further defined in the following claims.

Thus it can be seen that the invention accomplishes at least all of its stated  
objectives.

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